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ABSTRACT

This report discusses the outcomes of a study that explored the feasibility of using vision therapy (VT) as part of an interdisciplinary approach to the education of children with autism. Traditional research on VT has explored its usefulness in helping patients to use both eyes together, improve depth perception, and enhance visual acuity. Because visual problems accompany many learning difficulties/disabilities, VT is increasingly used in these cases. It was hypothesized that since children with autism often have pronounced visual-motor integration (VMI) deficits, VT may be helpful to them. The test of Visual Analysis Skills (VAS) was administered to two boys and one girl (ages 12-13) with autism. Overall, it was found that the children had great difficulty in performing the presented task correctly. The first participant was completely unresponsive to the task and was, thus, unable to perform a grid reproduction. The next participant initiated the task but perseverated and, therefore, failed to complete the task successfully. Following demonstrations, he was able to duplicate the grid, however, he continued connecting lines outside of the pattern. The final participant was also able to duplicate the grid following demonstration, but also perseverated, became frustrated, and activity ceased. (Contains 10 references.) (CR)

Educational Applications of Vision Therapy:

A Pilot Study on Children with Autism

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Abstract

This study explored the feasibility of using vision therapy (VT) as part of an interdisciplinary approach to the education of children with autism. Traditional research on VT has explored its usefulness in helping patients to use both eyes together, improve depth perception, and enhance visual acuity. Because visual problems accompany many learning difficulties/ disabilities, VT is increasingly used in these cases. Some think VT may address the deficient visual-motor integration (VMI) which seems to underlie many educational problems. Since children with autism often have pronounced VMI deficits, VT may be helpful to them. The test of Visual Analysis Skills (VAS) was administered to a small sample of early adolescents diagnosed with autism. The procedure used was a modification of one depicted by Rosner (1993) in his book, Helping Children Overcome Learning Difficulties. The majority of the participants found the stimulus materials engaging. However, perseveration and poor frustration tolerance hindered successful task completion.

Vision Therapy for Children with Autism: A Pilot Study

Vision therapy, while rarely known or understood, has actually been available for quite some time. Research often focuses on vision therapy's usefulness in helping patients to use both eyes together, improve depth perception, or even enhance the precision with which one sees (Cook 1995). Vision is often thought of as visual acuity, however it is also the ability to obtain information from a stimulus. Vision therapy is used to help correct or enhance the visual problems faced by many. One forth of school-age children are influenced by some vision disorder. In many cases, visual problems accompany learning difficulties or disabilities. In fact, vision problems may exacerbate learning dysfunctions as they impair the child's ability to learn. Thus, vision therapy, which is often used as part of an interdisciplinary approach, allows the child to take full advantage of their educational experience. In addition, vision therapy is supported by the American Optometric Association as an effective method of treatment for physiological, neuromuscular, and perceptual dysfunctions of the visual systems. "Optometric vision therapy assists individuals in developing visual abilities and efficiency most suited to their needs and enables those individuals to achieve maximal levels of visual performance" (http://www.aoanet.org/ia-op-vis-ther.html).

To understand vision therapy and its use, it may first be important to have a basic understanding of vision. Binocular vision occurs when the eyes both focus on a stimulus and work together in a coordinated fashion. Stereopsis combines the images of the two eyes to produce one image with the added dimension of depth. If good binocular vision is present the individual is able to perform several visual processes including tracking, fusion, stereopsis, convergence, and visual motor integration. When these skills are not functioning correctly a binocular vision impairment may be present. When irregularities do occur in the visual system, vision therapy provided by properly trained individuals has been found to be extremely successful in the development or recovery of these skills. (Vision therapy should not be attempted without supervision as problems including the reinforcement of poor visual habits may occur) (http://www.children-special-needs.org/index.html).

Vision therapy can be used to treat diagnosed visual dysfunctions, prevent the development of visual problems, or improve visual performance. It is used with several visual conditions including binocular dysfunctions, amblyopia, accommodative dysfunctions, ocular motor dysfunctions, visual motor disorders, and visual perceptual disorders. Treatment may include lenses, prisms, filters, etc (http://www.children-

special-needs.org/vision-therapy/optometric-vision-therapy.html).

Effects of vision therapy can also be seen in changes in the patients' quality of life. Cook studied patients' perceptions of the benefits of vision therapy by asking those who had completed a vision therapy program, due to problems of binocularity or strabismus, to complete a survey. Direct feedback from the participants was used to assess the outcome of vision therapy. Responses which occurred with a frequency of four or more times, were included (Cook 1995).

While several beneficial changes were noted, among the top five were improved reading, reduced frequency of headaches, better grades in school, improved confidence or self-confidence, and increased enjoyment of reading. The various responses were grouped into behavioral categories to illustrate changes in quality of life. The first category, changes in ocular symptoms, dealt mainly with changes associated with the eyes. Especially important were responses indicating increased comfort and clarity of seeing. Changes in reading, the second category, were, perhaps, more important to patients, as responses here were the most common. This category was broken into the subgroups of reading ability and reading habits, with responses indicating improved competence and more interest, respectively. Because improvements in academics were noted as occurring in

areas other than reading, a third category, other academic changes, was included. This section included comments regarding improvements in schoolwork, homework, and/or school performance. Behavioral changes constituted the fourth category. Generally, reports within this category were related to perceived benefits in emotional well-being or improved attention. Finally, the last category involved changes in localization and navigation skills. This included improved eye-hand or eye-body coordination. Hence, it seems that vision therapy, through changes in various areas, can positively affect one's perception of quality of life (Cook, 1995).

Strabismus is the most common visual abnormality in children ages 6-17 years old, as found by the National Center for Health and Statistics. Strabismus is a condition occurring when the affected person tries to look at something and, one eye points where they want to look and the other aims elsewhere. The person sees two images, superimposed on each other, and the remainder of the visual field is seen in double. Faulty innervation or coordination of the ocular muscles, rather than actual paralysis of the muscle, most commonly causes strabismus. It can be constant or intermittent and can switch between eyes (Flax, 1993).

Strabismus affects the control of the motor system over eye position and eye movements. This causes two main problems.

First, it can be cosmetically disfiguring, depending on the angle of the eye turn and the configuration of the child's face. Second, there is a lack of proper sensory integration of the eyes, which causes perceptual problems. One adaptation that some strabismus sufferers apply themselves is suppression. They involuntarily block out or ignore what the deviated eye is seeing, affecting their ability to make precise distance judgments. This can be very detrimental and can lead to more serious vision problems; blindness may even occur if a child begins suppression at an extremely young age. Two methods of treatment have been identified to deal with strabismus. The first is a surgical procedure to shift the eye position by strengthening or weakening one or more of the six muscles that move each eye. However, many operations are often necessary, and they are only successful if the angle of turn in the eye is reduced below a noticeable amount. The second suggested treatment is vision therapy (VT). When used for treating strabismus, vision therapy has been found to be 76% successful in terms of visual acuity and 86% successful from the cosmetic standpoint. Long-term stability has also been shown to occur when vision therapy is used (Flax, 1993).

While vision therapy is a useful treatment for strabismus, it can also be applied to cases involving treatment of deficient visual-motor integration (VMI). VMI is the ability to use

visual information to plan, execute, and monitor a motor task. Eye-hand coordination is often used synonymously with VMI. In a academic settings there are three important classroom tasks that directly require the use of VMI: writing, copying, and working through written math problems. When deficient VMI is recognized through various means, including poor penmanship, it can be a strong predictor of future learning problems. Thus, it becomes important to understand how successful vision therapy is in reducing deficient VMI (Tassinari and Eastland, 1997).

Vision therapy is to the eyes what physical therapy is to the body. When something is not functioning correctly, therapeutic measures are often used. The basic VT process is defined by teaching the child to copy patterns. Various patterns built around a grid are used. With appropriate training, the child becomes able to transfer the pattern onto a blank grid, keeping all points in the appropriate places. In so doing, the underlying processes of visual analysis skills are learned by the child. Thus, rather than simply learning to copy a shape, the child learns correct visual analysis skills and obtains appropriate skills for their age range (Rosner, 1993).

In a study done by Tassinari and Eastland (1997), optometric vision therapy (VT) was used for the treatment of VMI. The purpose of this study was to provide evidence that supports the hypothesis that the direct treatment approach of VT

can improve VMI among subjects who are diagnosed as having deficient VMI. Examiners selected subjects from a private optometry practice. The presence or absence of deficient VMI symptoms was determined by direct questioning during case history, a written parent questionnaire, and a written teacher questionnaire. The Beery Developmental Test of Visual-Motor Integration (DTVMI), a graphomotor copying test, was used as a pre and post test in the experiment. The VT was performed in an hour long one-on-one session that was held once a week at the office, for approximately 8 months. Intervention tasks included visual motor stick activities, Rosner Geo boards, and pointer tracing. At home VT tasks were also practiced daily; these exercises included Rosner graphomotor copying, VMI workbooks, and mazes (Tassinari & Eastland, 1997).

Results showed an 85% success rate in raising a failing VMI score to a passing score. A 93% success rate was shown for reducing symptoms associated with deficient VMI. Both of these results support the practice of using optometric VT to treat deficient VMI. While the results are promising, more research is needed, as no control group was used (Tassinari & Eastland, 1997). Hence, vision therapy may be an effective treatment for deficient visual - motor activity.

Given the apparent effectiveness of VT in addressing deficient VMI, it seems likely that VT may benefit children with

a wide variety of disorders marked by VMI deficiencies. Autism presents itself through several symptoms, some of which include visual problems. Autism's various visual symptoms include poor eye contact, difficulty attending visually, excessive visual searching, and generally unusual reaction to sight. Amid other possibilities, vision therapy may be useful in helping the person with autism to organize space, gain peripheral stability, and, in turn, attend to and appreciate more normal central vision (Rose & Torgerson, 1994).

In a study by Rose and Torgerson (1994), prior to the use of traditional vision therapy for autistic persons, other activities were used to improve awareness of the peripheral world. Visual arousal activities were used initially. For approximately three to nine months, activities to stimulate the ambient visual system, increase attention and awareness, and improve ability to visually direct were administered. Improvements were often gradual. Following the start of vision therapy, prescription lenses are often changed as increases in visual ability are achieved. After the visual system seemed to be functioning at a normal level, the therapy was slowly reduced. This may be done by cutting the time of sessions in half, as a smooth transition is necessary to help maintain desired results (Rose & Torgerson, 1994).

While most of the issues discussed thusfar are recognized during childhood, if left untreated they will persist into adulthood. Unfortunately, there are many adults who have been left undiagnosed and untreated. Several adults do face the difficulties associated with learning disabilities. Studies often find that among those with minimal learning disabilities are predominantly employed in entry-level, unskilled positions. Often, adults define their problem as some form of information-processing deficit. Interestingly, a study by Friedman found that all of the learning disabled adults in the sample had poor visual perceptual function. Through testing, it was found that these adults had characteristics extremely similar to people who have experienced head injuries. Those suffering head traumas have difficulties with cognitive and visuospatial functioning, as do learning disabled adults. However, with therapy, problems can be diminished for the learning disabled groups, as their problems tend to be more related to academics than to a gross motor component (Friedman, 1995).

For some learning-disabled adults vision therapy may be a potential solution. When turning to vision therapy, it is important to make the program as personalized as possible, because needs and goals vary and subjective progress is important (Friedman, 1995). Vision therapy is typically individualized; hence, it is designed to treat the nature and

severity of the patient's visual problem(s) (http://www.children-special-needs.org/vision-therapy/optometric-vision-therapy.html). Vision therapy is often "short-term"; length may be dependent upon the physical condition, mental motivation, and the extent of therapy per week. Typically, therapy lasts between three months to two years with sessions occurring a few times per week (http://www.add-adhd.org/vision-therapy-FAQ.html). Luckily, computer administered vision therapy is available and can be beneficial in providing visual and integrative processing skills through a program modified to fit the individual's specific needs. Furthermore, for adults it may be important to have the ability to work through the program at home on their own time (Friedman, 1995).

After reviewing previous work, it was questioned whether vision therapy could be used with autistic children. The level of engagement necessary for vision therapy may be too intense for some autistic children. Thus, rather than initiating a formal intervention with this population simple exercises with the materials were done to evaluate if autistic children were able to perform the task. Performance would indicate if a potential exists for the use of vision therapy within this population.

Method

Participants

Three adolescent autistic children were recruited during an autistic group meeting at a local church. The sample included two boys and one girl with ages ranging from 12-13.

Apparatus

The Test of Visual Analysis Skills (TVAS) was used to assess the reading levels of autistic children. See Appendix A. Other grids were also used to further examine their ability and tolerance for vision therapy intervention.

Procedure

The procedure used here was a modification of one depicted by Rosner (1993) in his book, Helping Children Overcome Learning Difficulties. Each child was given the TVAS and their score recorded for later analysis. Vision therapy grids were then presented for more exposure to the grids. Patterns were presented on various grids starting with a five-dot map, and then progressing through 9 and 25 dot maps. See appendix B. A pattern was shown to the child which was to be accurately reproduced. If an error occured and the child did not recognize it on his own, the researcher simply told the child there was one. The child was then to look for the error and if he was unable to find it the researcher would help by giving cues as to counting points, judging length of lines, etc.

In cases where the child seemed to have no difficulty, they were moved ahead to the next dot level. However, if the child showed major difficulties resulting in frustration activities were ceased. The researcher remained with the child doing other work until frustration seemed to be reduced. Following the session an evaluation of participation was completed for later analysis.

Results

Overall, it was found that the autistic children tested had great difficulty performing the task correctly. The first participant was completely unresponsive to the task presented and was, thus, unable to perform grid reproduction. The next participant initiated the task but perseverated and, therefore, failed to complete the task successfully. Following demonstration, he was able to correctly duplicate the grid; however, he continued connecting lines outside of the pattern. The final participant was also able to correctly duplicate the grid following demonstration, but also perseverated. Upon further attempts the subject became frustrated, thus the activity was ceased. In order to help her calm down, she was offered a quiet, private area.

Discussion

The majority of the participants found the stimulus materials engaging. However, perseveration and poor frustration

tolerance hindered successful task completion. Therefore, it seems that for higher-functioning autistic children, vision therapy may be an appropriate part of an interdisciplinary approach to the treatment of autism. It was found that the participants performed better after an example was provided by the researchers. This may be necessary to focus attention as well as to provide direction for how to perform the task at hand. Prior to the task, all of the subjects were observed to be in a positive or even playful state of mind. For higher-functioning autistic children it is unknown if mood can have an effect on engagement or performance on the task. Because one of the subjects was shy and seemed to become emotionally overwhelmed, it may be beneficial for the autistic child to have a prior relationship with the vision therapist for a successful intervention to occur. While vision therapy may not be applicable to all cases of autism, some should be able to handle this type of intervention. Future research could show that under the right circumstances vision therapy may benefit autistic children.

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Appendix A
Excerpted from Rosner, J. (1993) Helping Children Overcome Learning Difficulties

THE TEST OF VISUAL ANALYSIS SKILLS

The TVAS, in addition to identifying children with deficient visual analysis skills, provides information about how to remediate the deficient skills by defining what the children have to learn. We can help the child by teaching him to "pass the test."

That is the unique feature of the TVAS. All the other tests become invalid if you teach the child to pass them. For example, if you set about teaching a seven-year-old child who cannot copy a diamond how to do it, you will probably succeed. He is likely to learn how to copy a diamond. But you certainly cannot conclude from that accomplishment that he has also learned the underlying processes needed to copy all shapes of that complexity. Just because a child learns to copy a diamond, and copying a diamond is something expected of seven-year-olds, does not indicate that he has acquired the visual analysis skills of the average seven-year-old.

The opposite is true of the TVAS. As you teach the child to copy patterns like those used in the test, you will be teaching him underlying processes—visual analysis skills. And he will illustrate his gains in the TVAS and all of the other copying tests.

Instructions for administering the TVAS and interpreting the scores are given below. Instructions for using this information in a remediation program are in chapter 8.

Administering the Test

All you need are the test patterns (see pp. 34–38), a sheet of clear acetate, a felt-tip (washable) pen or a crayon, and a tissue. In order to administer the test, redraw the patterns on two-inch squares (see p. 171).

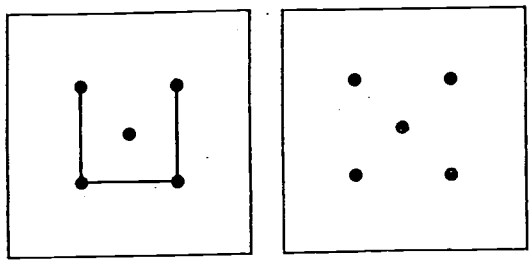
The Test Items

The TVAS consists of eighteen items—geometric designs that are positioned on dot matrices ("maps"). The child's task in the first nine items is to copy the designs onto a matching map. In items ten through eighteen: to copy the designs onto maps in which some (and ultimately, all) of the dots have been removed.

As such, the items differ (and become more difficult) on the basis of the complexity of the design, the number of dots in the map on which the design has been positioned, and the number of dots on the map where the child is to copy the design. The importance of these three pieces of information will become apparent when we discuss remediation in chapter 8.

Start with item one on page 34. It presents two five-dot maps, with a rather simple design plotted on one of the maps. The child's job is to copy that design onto the other five-dot map.

Place a sheet of clear acetate over the five-dot map on which the child is to draw. Seat the child at a suitably sized table, give him the felt-tip pen (or crayon) and ask him to "Make your map [point to the map on which he is to draw] look like this one." (Point to the map on which the design is printed.)



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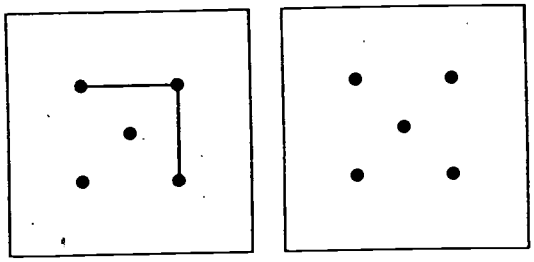

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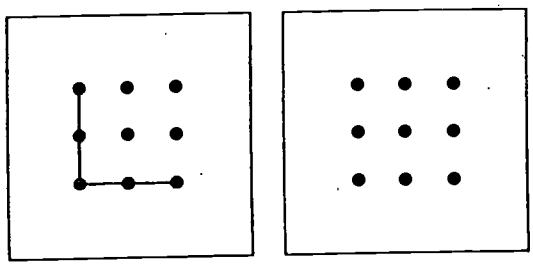

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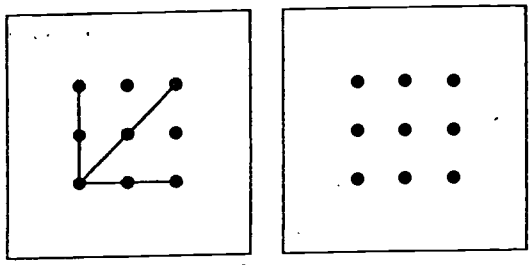

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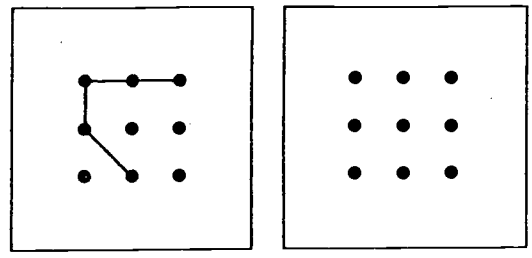

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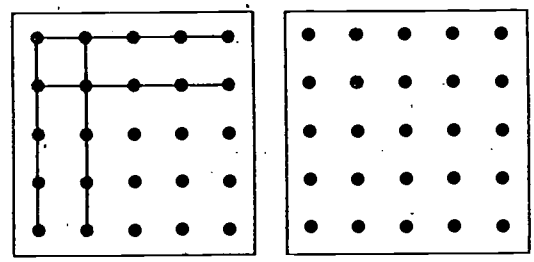

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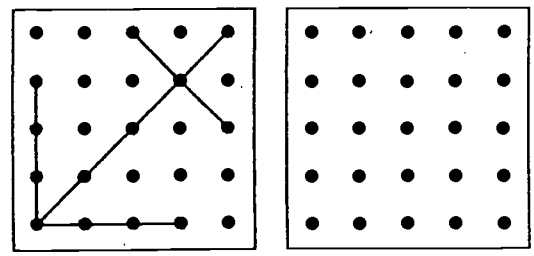

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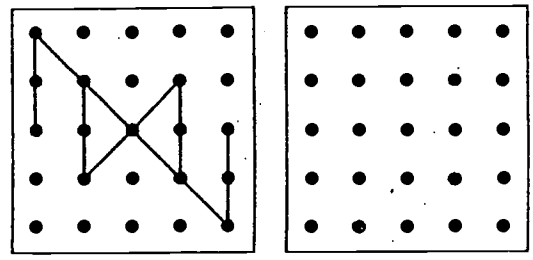
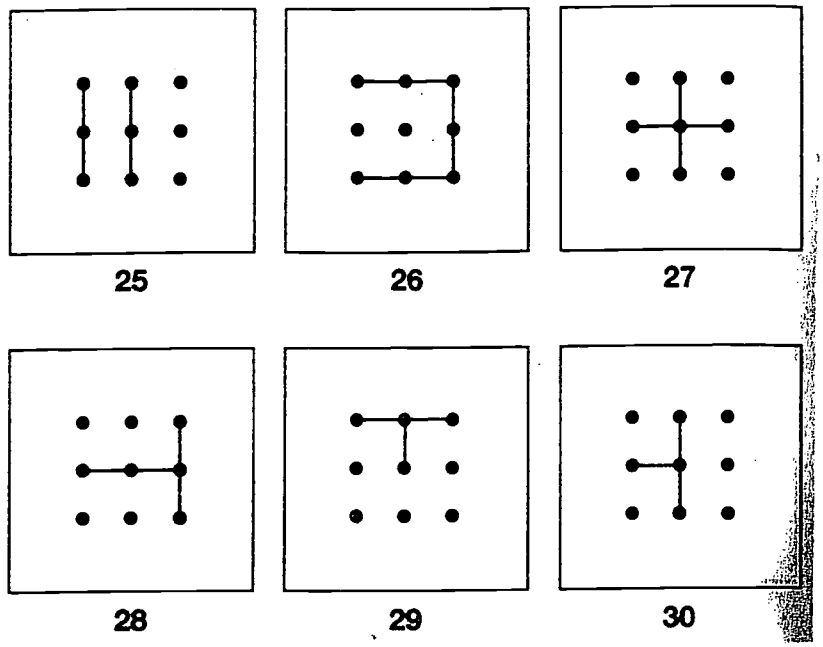


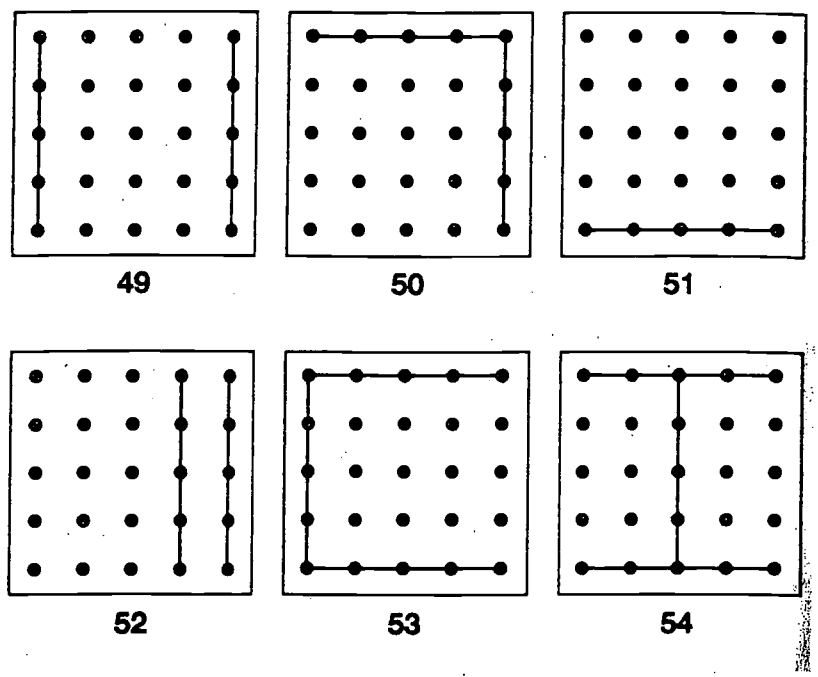
8

Appendix B
Excerpted from Rosner, J. (1993) Helping Children Overcome Learning Difficulties

Sample 9-Dot Map



Sample 25-Dot Map



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